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AJOB Neurosci. Author manuscript; available in PMC 2022 March 19.

Published in final edited form as:

AJOB Neurosci. 2022 ; 13(1): 60–62. doi:10.1080/21507740.2021.2001083.

Ethical Challenges in the Commercialization of Neurotechnology: Contending with Competing Priorities

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The seven ethical issues and principles explored in the target article (i.e., privacy, responsibility, access, stigma, user control, family impact, enhancement) reflect important considerations for developing and implementing neurotechnologies. Survey findings suggest that neural device representatives and the general public agree on the importance of these ethical issues (MacDuffie, Ransom, and Klein 2022). However, noteworthy ethical areas of divergence warrant consideration by all relevant neurotechnology stakeholders including academic scholars, federal agencies, clinicians, and the public. It is imperative that these ethical issues are taken into account as neural technologies are designed, developed, and made available for public consumption. Reconciling these areas of divergence becomes increasingly critical as industry partners with academic and government institutions (National Institutes of Health 2021). In what follows, we elucidate some tensions industry may face when contending with competing priorities and provide suggestions for responsibly navigating these tensions.

COMPETING GOALS BETWEEN SCIENCE AND INDUSTRY

The 2017 report on fostering integrity in research by the National Academies of Sciences, Engineering, and Medicine (NASEM) articulates six scientific values that uphold scientific integrity: objectivity, honesty, openness, accountability, fairness, and stewardship (National Academies of Sciences Engineering and Medicine 2017). As these values relate to the questions explored in the survey from the target article, they could also be reflected in the design of neurotechnologies and included in a code of ethics. Survey findings suggest that those working in industry seek guiding ethical principles in the conduct of their work. However, the neurotechnology industry faces fiduciary obligations, typically to a corporation's shareholders. These obligations, often financial in nature, have the potential to compete with scientific values and, if not navigated appropriately, undermine scientific integrity.

FISCAL MOTIVES

Survey responses from industry partners indicate a commitment to uphold ethical values in the conduct of their work and the development of neurotechnologies. At the same time, prevailing contextual and situational factors exist that can shape decision-making

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in a manner that does not guarantee these scientific ethical principles are executed in practice. A capitalist economic system drives strong fiscal incentives in the neurotechnology industry that can undermine scientific values and unduly shape scientific neurotechnology development. We now turn to the six scientific values from the NASEM report and contrast them with fiscal and market-based motives that the neurotechnology industry faces. We also note opportunities for the neurotechnology industry to balance these competing goals to more effectively uphold scientific values.

OBJECTIVITY

The NASEM report identifies objectivity as an attitude that should drive the conduct of innovative work, and this includes the development of neural technologies. The main tenet of objectivity is that subjective factors, such as personal beliefs, motivations, and interests, should not shape or bias the design, conduct, or reporting of the scientific work behind innovative products. Organizational expectations and cultures play a role in shaping individual beliefs and behaviors and set the tone for the extent to which impartiality is valued (Schein 2010). In a drive to bring new products to market, objectivity can be compromised, especially in situations involving time pressure or pressure to reach certain outcomes. To counterbalance these pressures, organizations can establish policies and norms that reinforce the importance of objectivity. For example, organizations could adopt policies that encourage employees to speak up if they sense feeling rushed or if corners are being cut in the development of a new device. After receiving this feedback from employees, organizational leaders must respond effectively and quickly to address employee concerns. This response could involve adjusting project timelines, increasing support and resources, or adopting new processes (e.g., establishing procedures for internal peer review and replication).

HONESTY AND OPENNESS

Scientific values of honesty and openness are central to cultivating trust and quality relationships among neurotechnology research stakeholders. The successful interplay between scientific and commercial enterprises requires trustworthiness and transparency. Yet, financial and market pressures may make it challenging for the neurotechnology industry to uphold values of honesty and openness in a manner consistent with scientific expectations. For example, it may be tempting for the neurotechnology industry to design clinical trials to increase the yield of positive findings, selectively report findings, or downplay adverse findings in the development of new neurotechnologies (Als-Nielsen et al. 2003); those in the neurotechnology industry may view these tactics as a mechanism for increasing the likelihood of device success and marketability. However, engaging in such practices undermines the integrity of the research driving new neurotechnology innovations and may result in stakeholder mistrust. To reinforce scientific values within an industry setting, organizations could adopt rules that mandate information transparency about a new product’s research and development cycle. To balance legitimate concerns those in the neurotechnology industry may have related to protecting trade secrets, organizations could establish policies that grant access to this type of information under certain stipulations or restrictions (e.g., delayed release of information).

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ACCOUNTABILITY

Accountability involves justifying decisions (e.g., related to clinical trial design or how and what data inform the development of new technology) and demonstrating the validity of these decisions to relevant stakeholders. As accountability relates to industry's development of neurotechnologies, entities within the neurotechnology enterprise should be able to trust that technology is scientifically robust. Information about a particular neurotechnology and its functionality should be accurate and verifiable. The neurotechnology industry may be wary of sharing proprietary information about neurotechnology and its development. This makes it challenging for the larger neurotechnology community to hold the involved organization accountable and assess the reliability of research supporting the development of neurotechnologies.

To offset these concerns, the neurotechnology industry can involve objective third parties external to the organization to evaluate the integrity of the work (e.g. data monitoring board) while keeping proprietary information confidential. Objective external review is one of the primary means of establishing accountability (DuBois et al. 2013). By routinely providing public access to reports describing external reviewers' evaluation of research conduct and data behind new neurotechnologies, organizations can reinforce stakeholder perceptions of the reliability and trustworthiness of the organization and its neurotechnologies. Changes to reporting requirements for obtaining Food and Drug Administration (FDA) approval may also be needed to ensure accountability (e.g., mandating and enforcing full disclosure of all safety and efficacy data obtained on an investigational drug or device across all trials conducted).

FAIRNESS AND STEWARDSHIP

The values of fairness and stewardship constitute critical components of industry-sponsored clinical trials to test the effectiveness of new neurotechnology in humans. As they relate to industry, fairness and stewardship may involve engaging in practices not conventionally rewarded or recognized. The neurotechnology industry should consider the post-clinical trial obligations to individuals whose participation in research makes the development of new neurotechnologies possible. For example, participants in these clinical trials may require care or device upkeep after the trial ends. Providing this support to research participants may, at first, seem cost-prohibitive, but this promotes long-term public trust. Acknowledging and responding to the needs of stakeholders at a societal level is also the right thing to do.

CONCLUSION

Leaders and decision-makers in the neurotechnology industry may find themselves struggling to navigate the inherent tensions between scientific values and capital goals (Fins and Schiff 2010). Given the magnitude of capital and billions of dollars of market share at stake (Research and Markets 2018), the neurotechnology industry may be drawn toward shaping research and development processes to expedite neurotechnology commercialization (McIntosh and DuBois 2020). However, profitability and ethicality do not have to be mutually exclusive. It may be in the financial best interest for the

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neurotechnology industry to engage in rigorous and transparent research to avoid federally-imposed fines for suppressing data and lawsuits for producing technologies that can be harmful. To minimize the extent that market-based fiscal biases unduly shape the conduct and application of neurotechnology research, the neurotechnology industry can leverage business ethics principles, such as corporate social responsibility, to navigate these tensions responsibly while maintaining profitability (Porter and Miles 2013). Approaching the design, development, and dissemination of neurotechnologies in this way can positively shape public perceptions of neurotechnologies and the organizations that provide them.

FUNDING

This work was supported by NIH grant UL1 TR002345.

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